Effect of Lathyrus Protein Concentrate Feeding on the Growing of Children

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Abstract

To combat protein energy malnutrition (PEM) among poor urban slum children Lathyrus protein concentrate (LPC) may be a useful supplement. A cross sectional study with a total of 10 children aged 1-3 years was carried to find out the effectiveness of Lathyrus Protein Concentrate (LPC) feeding on the growth of children. Before intervention the children were severely underweight. In this program, an intervention of 59.6 gm of Suji based diet along with 20 gm of LPC was fed to each children daily for a period of 15 weeks.

Mean weight gain was 1.23kg in children fed with Suji containing LPC during a period of 15 weeks intervention. We found a significant positive correlation between weight gain and duration of LPC containing food supplementation. Effectiveness of the intervention program for attaining growth among children was 44.05%. The findings reveal that LPC may be considered as an effective protein concentrate for reducing PEM among the children.

Key wards :- Lathyrus Protein Concentrate, Neurotoxin, Protein Energy Malnutrition, Child growth

Introduction

Protein energy malnutrition is a national problem for most of the developing countries[1]. Protein is needed for growth and development of growing children. In extreme deficiency of energy, protein is utilized for energy production instead of its normal growth functioning. As there is severe deficiency of energy and protein in the developing countries, PEM in the children often becomes a problem of national significance. In these countries proteins of animal origin is less available compared to

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that of plant origin and as such biologically inferior plant proteins are largely consumed in developing countries. Pulses of various kinds are normally eaten by the people of all sections as protein sources. One of the well known pulse--Lathyrus Sativus (Khesari) is produced abundantly in Bangladesh. About one-third of total pulse production in the country is kheshai[2] which is rich in protein. However, if large amount of Khesari are taken for a long time, a nerve disorder called Lathyrism may develop in the human being due to β–N–Oxalyl–α, β–diamino propionic acid (ODAP), a water soluble neurotoxin present in Khesari. The simple procedure to detoxify the seed is washing. Some researchers suggested that boiling or steeping the seeds in water and then discarding the water is a way to remove about 70% of the toxin.

Yusuf et al[3] prepared a protein concentrate from Lathyrus sativus seed by a simple two step procedure. The concentrate was virtually free from ODAP and its in vitro digestibility was 99%. The protein content of LPC (Lathyrus Protein Concentrate) was 90.10% which was composed of four major globulin fractions of apparent molecular weight of 113,000, 100,000, 55,000 and 24,000 respectively. Amino acid analysis showed that the contents of the sulfur amino acids methionine and cysteine in the LPC were rather low. All other amino acids including lysine were present in appreciable quantities. The content of the toxin in LPC was only 0.0014%, which is 0.5-0.8% in the seed and could be fed to human expectedly without any fear of harmful affect. Thus, LPC became a good concentrated food of protein. As the children between 1and 3 years of age need highest amount of protein per kg body weight, it is expected that this LPC might increase the growth rate of these children suffering from PEM. Hence, to examine the effectiveness of LPC in reducing PEM through enhancing the growth among these children, this study was carried out.

Materials and Methods

Selection of sample: Ten severely malnourished children aged 1-3 years from Beltala Slum of Dhaka City were purposively selected for the study upon receiving informed consent signed by the parents or legal guardians. The children were given supplementary food with Suji containing LPC as per formula given below :

Formula of Supplementary food

Ingredients	Amounts
Suji	100 gm
Sugar	250 gm
Oil	40 gm
Multivita-Mineral	2 drops
Vanilla	4 drops
* LPC	200 gm
Water	500 ml(app.)
Total solids only	596 gm
Per head average	59.6 gm

* LPC = Lathyrus Protein Concentrate.

Preparation of food for intervention: The amount of LPC allocated for the children was taken in a container and boiled with sufficient water. Suji was fried in oil until the colour changed to brown and then boiled LPC was added to it. The mixture was cooked up to certain concentration and then multivitamin, multi-mineral and vanilla drops were added accordingly.

Feeding procedure: Prepared food was divided into ten equal parts for each of the children. Each child thus consumed orally 59.6 gm of solid ingredients containing suji, sugar, oil and 20 gm of LPC every day and this amount of food was given to each child for a total period of 15 weeks.

Growth Monitoring: The growth of each child was monitored regularly by anthropometric measurements. Height and weight of each child was recorded before starting food intervention. Then weight was recorded every week and height was measured fortnightly till the end of the study period of 15 weeks.

Clinical Observation: During intervention different clinical signs and symptoms related to malnutrition were observed.

Data processing and analysis: After coding and editing, anthropometric data were analyzed as standard deviation scores (Z-scores) using NCHS reference weight-for-age as well as percentage of reference median. The anthro and SPSS software package were used in this regard. Appropriate statistical tests were done as needed.

Results

Table 1 shows the age, height and weight distribution of children. Mean age of the children was 21.50 ± 4.04 month. Average height and weight of the children was 75.78±5.17 cm. and 6.82±1.28 respectively.

After 15 weeks of feeding intervention mean weight of the children was increased by 1.23 kg from 6.28 kg at baseline to 8.05 kg after intervention (Table 2). Baseline nutritional status of the children was found to be severely underweight (mean WAZ – 3.95). After intervention mean WAZ decreased (- 2.21) with a difference of WAZ between baseline and after intervention by 1.74 **(Table 3).** The effectiveness of food intervention programme with LPC was 44.05%.

Figure 1 shows that weight gain is positively correlated with duration of LPC supplementation. Significant positive relationship was found ($r=0.75$, $p<0.01$) between weight gain and duration of supplementation.

Table 1: Age, height and weight distribution of the study children

Variables	Experimental (n=10) (Mean±SD)
Age (month)	21.5±4.04
Height (cm)	75.78±5.17
Weight (kg)	6.82±1.28

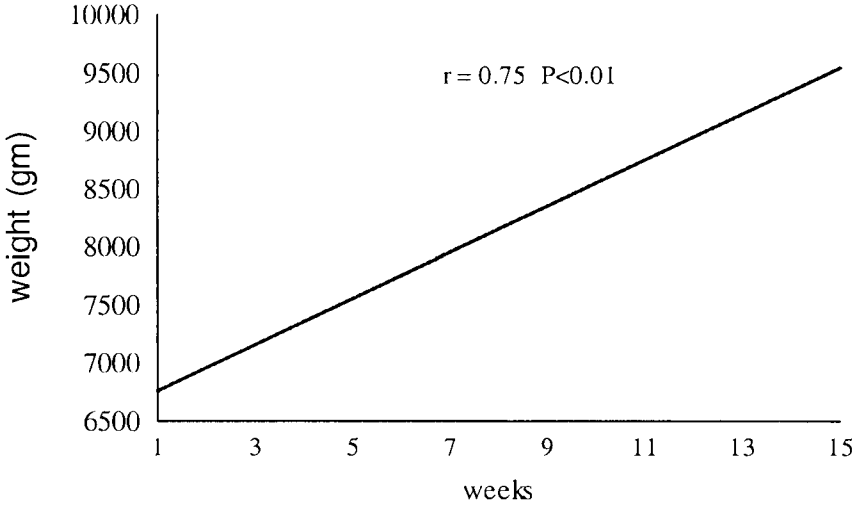
Table 2: Average weight of the children compared between baseline and after 15 weeks of supplementation

Source of variation	Mean Weight (kg)	Weight increase (kg)	Level of Significant
Baseline	6.82±1.28	1.23	p<0.05
After intervention	8.05±0.56		

Table 3: Comparison of nutrition status of the children by weight-for-age Z-score (WAZ) classification between baseline and after intervention

Source of variation	Mean Z-score	Difference	Effectiveness
Baseline	- 3.95	1.74	44.05
After intervention	- 2.21		

Figure 1: Linear trend of weight gain with duration of LPS supplementation



Discussion

The findings of food supplementation along with LPC showed that at the end of the feeding intervention the nutritional status in respect of Weight-for-age Z-score was improved showing an effectiveness of the feeding program by 44.05 percent. There was improvement of nutritional status of the children which was a shift from severe to moderately underweight (Table-2). The mean weight of the children significantly increased by 1.23 kg after 15 weeks intervention ($p<0.05$). Moreover, average weight gain by the children was found to be improved with the duration of LPC containing food supplementation as indicated by a significant positive correlation ($r=0.75$,

$p<0.01$). So the LPC may be advocated to be used as a good source of protein for growing children. The results, however, reveal that the LPC may provide an excellent source of concentrated protein which may be mixed with rice, bread, suji etc to enrich the protein content of the diet.

Protein Energy Malnutrition is one of the major problems for most of the developing countries like Bangladesh[1-3]. Growing children need comparatively higher amount of protein for their rapid physical as well as mental growth and development than others. But it is not possible for the poor people of the country to fulfil this demand and as such they become easy prey to nutritional problems.

Pulses are major source of protein. Khesari alone accounts for about one third of total pulse production in our country. It is cheaper than all other pulses. It contains about 30 percent protein, but it also contains ODAP a neurotoxin and produce lathyrism if taken in large quantities. This toxic element can be removed by different methods and it is possible to concentrate the protein of Khesari dal as Lathyrus Protein Concentrate (LPC). The LPC is easily digestable and may, therefore, be eaten as an ideal protein supplement by the people of all ages and sex groups, particularly by the growing children of poorer section of the population.

The present study clearly demonstrated the potentiality of LPC in the growth of children. Further in depth study with LPC supplementation on a large number of subjects is recommended so as to facilitate effort to produce LPC at a large scale for consumption throughout the country.

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